

## ภาคผนวกที่ 7

### เอกสารการสอบเทียบความถูกต้องของเครื่องมือ

# TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sample Location		Date	
Project Site		Start Date	October 23, 2023
Sample Number		Stop Date	01/05/24
Filter Number		Stop Time	01/05/24
Filter Serial Number		Filter Type	254
Recorder Serial Number		Recorder Model	254
Recorder Serial Number		Recorder Model	254
Recorder Serial Number		Recorder Model	254

Flow No.	Flow Rate (L/min)		Temperature (°C)	Pressure (mmHg)	Start Date	Stop Date
Flow No.	Flow Rate (L/min)	Flow Rate (L/min)				
1	1.5	1.4	2.8	760.0	01/05/24	01/05/24
2	2.0	1.8	3.8	760.0	01/05/24	01/05/24
3	3.0	2.8	4.8	760.0	01/05/24	01/05/24
4	4.0	3.8	5.8	760.0	01/05/24	01/05/24
5	5.0	4.8	6.8	760.0	01/05/24	01/05/24
6	6.0	5.8	7.8	760.0	01/05/24	01/05/24
7	7.0	6.8	8.8	760.0	01/05/24	01/05/24
8	8.0	7.8	9.8	760.0	01/05/24	01/05/24
9	9.0	8.8	10.8	760.0	01/05/24	01/05/24
10	10.0	9.8	11.8	760.0	01/05/24	01/05/24
11	11.0	10.8	12.8	760.0	01/05/24	01/05/24
12	12.0	11.8	13.8	760.0	01/05/24	01/05/24
13	13.0	12.8	14.8	760.0	01/05/24	01/05/24
14	14.0	13.8	15.8	760.0	01/05/24	01/05/24
15	15.0	14.8	16.8	760.0	01/05/24	01/05/24
16	16.0	15.8	17.8	760.0	01/05/24	01/05/24
17	17.0	16.8	18.8	760.0	01/05/24	01/05/24
18	18.0	17.8	19.8	760.0	01/05/24	01/05/24
19	19.0	18.8	20.8	760.0	01/05/24	01/05/24
20	20.0	19.8	21.8	760.0	01/05/24	01/05/24
21	21.0	20.8	22.8	760.0	01/05/24	01/05/24
22	22.0	21.8	23.8	760.0	01/05/24	01/05/24
23	23.0	22.8	24.8	760.0	01/05/24	01/05/24
24	24.0	23.8	25.8	760.0	01/05/24	01/05/24
25	25.0	24.8	26.8	760.0	01/05/24	01/05/24
26	26.0	25.8	27.8	760.0	01/05/24	01/05/24
27	27.0	26.8	28.8	760.0	01/05/24	01/05/24
28	28.0	27.8	29.8	760.0	01/05/24	01/05/24
29	29.0	28.8	30.8	760.0	01/05/24	01/05/24
30	30.0	29.8	31.8	760.0	01/05/24	01/05/24
31	31.0	30.8	32.8	760.0	01/05/24	01/05/24
32	32.0	31.8	33.8	760.0	01/05/24	01/05/24
33	33.0	32.8	34.8	760.0	01/05/24	01/05/24
34	34.0	33.8	35.8	760.0	01/05/24	01/05/24
35	35.0	34.8	36.8	760.0	01/05/24	01/05/24
36	36.0	35.8	37.8	760.0	01/05/24	01/05/24
37	37.0	36.8	38.8	760.0	01/05/24	01/05/24
38	38.0	37.8	39.8	760.0	01/05/24	01/05/24
39	39.0	38.8	40.8	760.0	01/05/24	01/05/24
40	40.0	39.8	41.8	760.0	01/05/24	01/05/24
41	41.0	40.8	42.8	760.0	01/05/24	01/05/24
42	42.0	41.8	43.8	760.0	01/05/24	01/05/24
43	43.0	42.8	44.8	760.0	01/05/24	01/05/24
44	44.0	43.8	45.8	760.0	01/05/24	01/05/24
45	45.0	44.8	46.8	760.0	01/05/24	01/05/24
46	46.0	45.8	47.8	760.0	01/05/24	01/05/24
47	47.0	46.8	48.8	760.0	01/05/24	01/05/24
48	48.0	47.8	49.8	760.0	01/05/24	01/05/24
49	49.0	48.8	50.8	760.0	01/05/24	01/05/24
50	50.0	49.8	51.8	760.0	01/05/24	01/05/24
51	51.0	50.8	52.8	760.0	01/05/24	01/05/24
52	52.0	51.8	53.8	760.0	01/05/24	01/05/24
53	53.0	52.8	54.8	760.0	01/05/24	01/05/24
54	54.0	53.8	55.8	760.0	01/05/24	01/05/24
55	55.0	54.8	56.8	760.0	01/05/24	01/05/24
56	56.0	55.8	57.8	760.0	01/05/24	01/05/24
57	57.0	56.8	58.8	760.0	01/05/24	01/05/24
58	58.0	57.8	59.8	760.0	01/05/24	01/05/24
59	59.0	58.8	60.8	760.0	01/05/24	01/05/24
60	60.0	59.8	61.8	760.0	01/05/24	01/05/24
61	61.0	60.8	62.8	760.0	01/05/24	01/05/24
62	62.0	61.8	63.8	760.0	01/05/24	01/05/24
63	63.0	62.8	64.8	760.0	01/05/24	01/05/24
64	64.0	63.8	65.8	760.0	01/05/24	01/05/24
65	65.0	64.8	66.8	760.0	01/05/24	01/05/24
66	66.0	65.8	67.8	760.0	01/05/24	01/05/24
67	67.0	66.8	68.8	760.0	01/05/24	01/05/24
68	68.0	67.8	69.8	760.0	01/05/24	01/05/24
69	69.0	68.8	70.8	760.0	01/05/24	01/05/24
70	70.0	69.8	71.8	760.0	01/05/24	01/05/24
71	71.0	70.8	72.8	760.0	01/05/24	01/05/24
72	72.0	71.8	73.8	760.0	01/05/24	01/05/24
73	73.0	72.8	74.8	760.0	01/05/24	01/05/24
74	74.0	73.8	75.8	760.0	01/05/24	01/05/24
75	75.0	74.8	76.8	760.0	01/05/24	01/05/24
76	76.0	75.8	77.8	760.0	01/05/24	01/05/24
77	77.0	76.8	78.8	760.0	01/05/24	01/05/24
78	78.0	77.8	79.8	760.0	01/05/24	01/05/24
79	79.0	78.8	80.8	760.0	01/05/24	01/05/24
80	80.0	79.8	81.8	760.0	01/05/24	01/05/24
81	81.0	80.8	82.8	760.0	01/05/24	01/05/24
82	82.0	81.8	83.8	760.0	01/05/24	01/05/24
83	83.0	82.8	84.8	760.0	01/05/24	01/05/24
84	84.0	83.8	85.8	760.0	01/05/24	01/05/24
85	85.0	84.8	86.8	760.0	01/05/24	01/05/24
86	86.0	85.8	87.8	760.0	01/05/24	01/05/24
87	87.0	86.8	88.8	760.0	01/05/24	01/05/24
88	88.0	87.8	89.8	760.0	01/05/24	01/05/24
89	89.0	88.8	90.8	760.0	01/05/24	01/05/24
90	90.0	89.8	91.8	760.0	01/05/24	01/05/24
91	91.0	90.8	92.8	760.0	01/05/24	01/05/24
92	92.0	91.8	93.8	760.0	01/05/24	01/05/24
93	93.0	92.8	94.8	760.0	01/05/24	01/05/24
94	94.0	93.8	95.8	760.0	01/05/24	01/05/24
95	95.0	94.8	96.8	760.0	01/05/24	01/05/24
96	96.0	95.8	97.8	760.0	01/05/24	01/05/24
97	97.0	96.8	98.8	760.0	01/05/24	01/05/24
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99	99.0	98.8	100.8	760.0	01/05/24	01/05/24
100	100.0	99.8	101.8	760.0	01/05/24	01/05/24
101	101.0	100.8	102.8	760.0	01/05/24	01/05/24
102	102.0	101.8	103.8	760.0	01/05/24	01/05/24
103	103.0	102.8	104.8	760.0	01/05/24	01/05/24
104	104.0	103.8	105.8	760.0	01/05/24	01/05/24
105	105.0	104.8	106.8	760.0	01/05/24	01/05/24
106	106.0	105.8	107.8	760.0	01/05/24	01/05/24
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108	108.0	107.8	109.8	760.0	01/05/24	01/05/24
109	109.0	108.8	110.8	760.0	01/05/24	01/05/24
110	110.0	109.8	111.8	760.0	01/05/24	01/05/24
111	111.0	110.8	112.8	760.0	01/05/24	01/05/24
112	112.0	111.8	113.8	760.0	01/05/24	01/05/24
113	113.0	112.8	114.8	760.0	01/05/24	01/05/24
114	114.0	113.8	115.8	760.0	01/05/24	01/05/24
115	115.0	114.8	116.8	760.0	01/05/24	01/05/24
116	116.0	115.8	117.8	760.0	01/05/24	01/05/24
117	117.0	116.8	118.8	760.0	01/05/24	01/05/24
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122	122.0	121.8	123.8	760.0	01/05/24	01/05/24
123	123.0	122.8	124.8	760.0	01/05/24	01/05/24
124	124.0	123.8	125.8	760.0	01/05/24	01/05/24
125	125.0	124.8	126.8	760.0	01/05/24	01/05/24
126	126.0	125.8	127.8	760.0	01/05/24	01/05/24
127	127.0	126.8	128.8	760.0	01/05/24	01/05/24
128	128.0	127.8	129.8	760.0	01/05/24	01/05/24
129	129.0	128.8	130.8	760.0	01/05/24	01/05/24
130	130.0	129.8	131.8	760.0	01/05/24	01/05/24
131	131.0	130.8	132.8	760.0	01/05/24	01/05/24
132	132.0	131.8	133.8	760.0	01/05/24	01/05/24
133	133.0	132.8	134.8	760.0	01/05/24	01/05/24
134	134.0	133.8	135.8	760.0	01/05/24	01/05/24
135	135.0	134.8	136.8	760.0	01/05/24	01/05/24
136	136.0	135.8	137.8	760.0	01/05/24	01/05/24
137	137.0	136.8	138.8	760.0	01/05/24	01/05/24
138	138.0	137.8	139.8	760.0	01/05/24	01/05/24
139	139.0	138.8	140.8	760.0	01/05/24	01/05/24
140	140.0	139.8	141.8	760.0	01/05/24	01/05/24
141	141.0	140.8	142.8	760.0	01/05/24	01/05/24
142	142.0	141.8	143.8	760.0	01/05/24	01/05/24
143	143.0	142.8	144.8	760.0	01/05/24	01/05/24
144	144.0	143.8	145.8	760.0	01/05/24	01/05/24
145	145.0	144.8	146.8	760.0	01/05/24	01/05/24
146	146.0	145.8	147.8	760.0	01/05/24	01/05/24
147	147.0	146.8	148.8	760.0	01/05/24	01/05/24
148	148.0	147.8	149.8	760.0	01/05/24	01/05/24
149	149.0	148.8	150.8	760.0	01/05/24	01/05/24
150	150.0	149.8	151.8	760.0	01/05/24	01/05/24
151	151.0	150.8	152.8	760.0	01/05/24	01/05/24
152	152.0	151.8	153.8	760.0	01/05/24	01/05/24
153	153.0	152.8	154.8	760.0	01/05/24	01/05/24
154	154.0	153.8	155.8	760.0	01/05/24	01/05/24
155	155.0	154.8	156.8	760.0	01/05/24	01/05/24
156	156.0	155.8	157.8	760.0	01/05/24	01/05/24
157	157.0	156.8	158.8	760.0	01/05/24	01/05/24
158	158.0	157.8	159.8	760.0	01/05/24	01/05/24
159	159.0	158.8	160.8	760.0	01/05/24	01/05/24
160	160.0	159.8	161.8	760.0	01/05/24	01/05/24
161	161.0	160.8	162.8	760.0	01/05/24	01/05/24
162	162.0	161.8	163.8	760.0	01/05/24	01/05/24
163	163.0	162.8	164.8	760.0	01/05/24	01

# TSP HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

Sample Location		Date	
Project Site		Start Time	October 23, 2023
Sample Number		Stop Time	02:14 PM
Master Serial Number		Office	02:14 PM
Recorder Serial Number		204	
Calibrator Serial Number		207%	
Calibrator Serial Number			No Population Monitoring

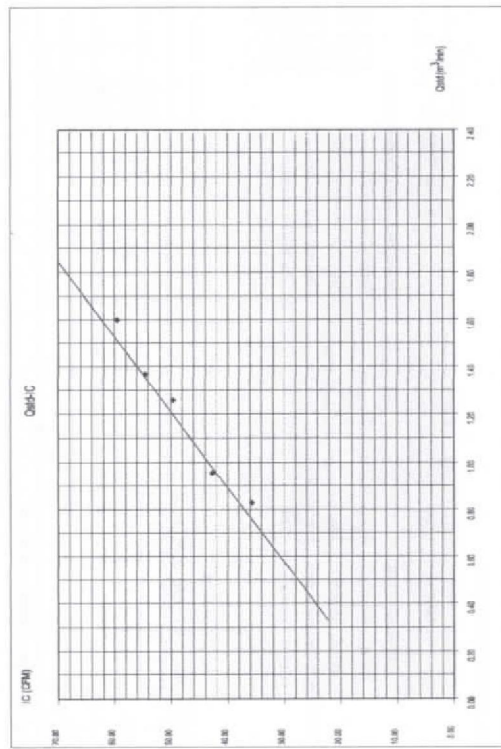
Flow No.	Data (1)		(A)	ΔΔCOP <sub>HP</sub> (kW) at ΔT <sub>HP</sub>	(B)	COP = (COP) <sub>HP</sub> - 1	(C)	ε = (P <sub>HP</sub> - P <sub>HP,0</sub> ) / P <sub>HP,0</sub>	Temperature (°C)	Refractive Index	Start Date	Stop Date
	Positive	Negative										
1	6	1.5	1.4	2.1	1.62(1)	0.1200	30.2	20.70	30.2	1.021		
2	7	2.5	1.3	1.8	1.64(1)	0.1700	41.2	43.30	30.2	1.021		
3	8	3.4	2.3	6.7	1.66(1)	0.2600	60.2	64.30	30.2	1.021		
4	9	4.4	3.9	1.9	1.69(1)	0.41	90.2	94.34	30.2	1.021		
5	5	3.5	3.4	10.8	1.70(1)	0.5679	100.2	104.30	30.2	1.021		
Linear Regression Y (A) = 1.94 x + 2.6												
1	Slope (m)		2.60(1) Linear Equation				Average		30.2	1.021		
2	Intercept (b)		-0.01(1) (at Slope Flow Rate = 1) (°C/m³)				1.021		°	0.00775	1/10	30.2
3	Correlation Coefficient (r)		0.99(1) (at Slope Flow Rate = 1)									0.00775(1/10) °C
4	R-squared (R²)		0.98(1) (at Slope Flow Rate = 1)									0.00775(1/10) °C

## TSP10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

[illegible]

COMMENT

Anderson Instruments, Inc.



Calibrated by:

MR. PATSAKORN MONTHONG

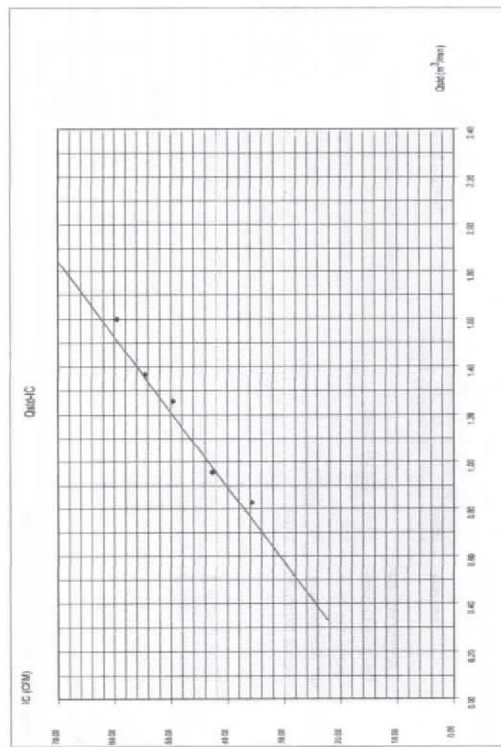
The end of calibration certificate.

## TSP10 HIGH VOLUME AIR SAMPLER CALIBRATION REPORT

[illegible]

COMMENT

Anderson Instruments, Inc.



Calibrated by:

MR. PATSAKRON MONTHONG

*The end of calibration certificate.*





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Health & Envitech Co., Ltd.

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## Analyzer Performance Test

Calibrated Date : 02 September 2023

### Instruments Information

Analyzer Type :	NO-NO2-NOx Analyzer	Manufacturer :	API
Model :	200A	Serial Number :	1176
Calibrator Unit		Standard Gas Concentration	
Dilutor Model :	Dasibi Model 5008	Nitric Oxide (NO)	55.54 PPM
Serial Number :	705	Sulphur Dioxide (SO2)	55.01 PPM
ZERO AIR Generator :	API MODEL 701	Carbon Monoxide (CO)	4.533 PPM
Serial Number :	1924	Cylinder number	EB0129030
Expire Date:			29 Oct. 2027

Environment : Temperature 25.5 °C Humidity 51 %RH

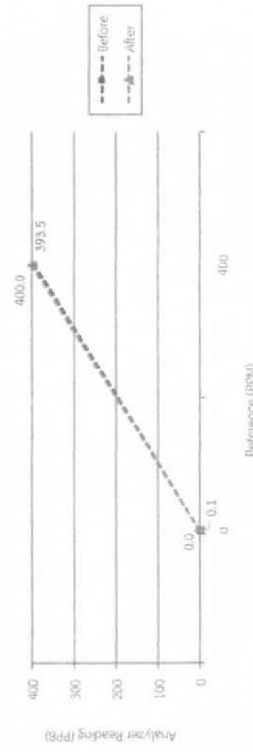
### Calibration Report (Before Adjust)

Status	Reference (PPB)	Reading (PPB)	Drift (PPB)	Drift%
NO	0.0	0.1	0.1	-1.6
NOx	0.0	0.0	0.0	-1.3

### Calibration Report (After Adjust)

Status	Reference (PPB)	Reading (PPB)	Drift (PPB)	Drift%
NO	0.0	0.1	0.1	0.0
NOx	0.0	0.0	0.0	0.0

Single Point Calibration Chart



Calibrate By :

Mr. Pasakorn Hmonthong

Approved by :

Mr. Rung Rittayan

## Analyzer Performance Test

Calibrated Date : 02 September 2023

### Instruments Information

Analyzer Type :	NO-NO2-NOx Analyzer	Manufacturer :	API
Model :	200A	Serial Number :	1524
Calibrator Unit		Standard Gas Concentration	
Dilutor Model :	Dasibi Model 5008	Nitric Oxide (NO)	55.54 PPM
Serial Number :	705	Sulphur Dioxide (SO2)	55.01 PPM
ZERO AIR Generator :	API MODEL 701	Carbon Monoxide (CO)	4.533 PPM
Serial Number :	1924	Cylinder number	EB0129030
Expire Date:			29 Oct. 2027

Environment : Temperature 25.5 °C Humidity 51 %RH

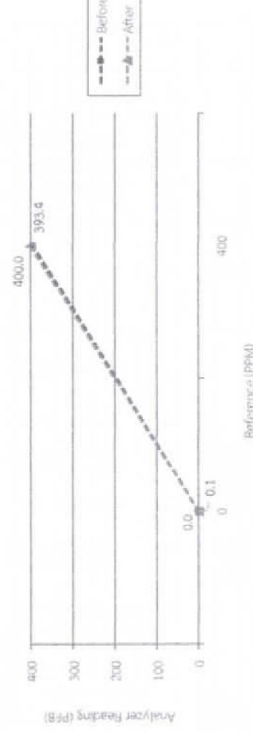
### Calibration Report (Before Adjust)

Status	Reference (PPB)	Reading (PPB)	Drift (PPB)	Drift%
NO	0.0	0.1	0.1	-1.7
NOx	0.0	0.0	0.0	-1.3

### Calibration Report (After Adjust)

Status	Reference (PPB)	Reading (PPB)	Drift (PPB)	Drift%
NO	0.0	0.1	0.1	0.0
NOx	0.0	0.0	0.0	0.0

Single Point Calibration Chart



Calibrate By :

Mr. Pasakorn Hmonthong

Approved by :

Mr. Rung Rittayan



บริษัท เฮลธ์ แอนด์ เอ็นไวเทค จำกัด  
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Tel (02) 625056-9 Fax : (02) 9230310, 5865355 www.healthenv.com Email : service@healthenv.com

## Analyzer Performance Test

Calibrated Date : 02 September 2023

### Instruments Information

Analyzer Type : NO-NO2-NOx Analyzer		Manufacturer : API	
Model : 200A		Serial Number : 2354	
Calibrator Unit		Standard Gas Concentration	
Dilutor Model : Dasibi Model 5008		Nitric Oxide (NO)	
Serial Number : 705		Sulphur Dioxide (SO2)	
ZERO AIR Generator : API MODEL 701		Carbon Monoxide (CO)	
Serial Number : 1924		Cylinder number	
		Expire Date:	

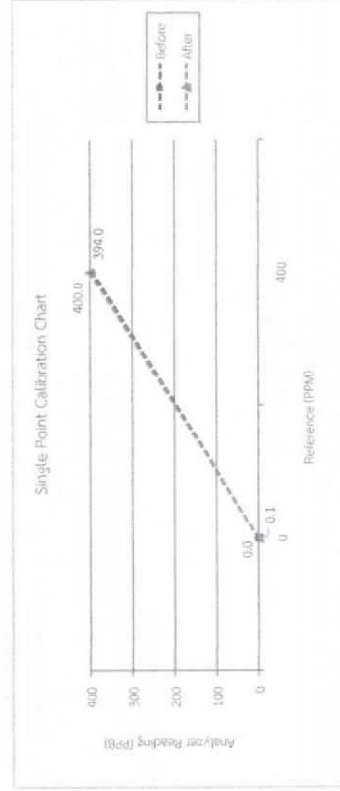
Environment : Temperature 25.5 °C Humidity 51 %RH

### Calibration Report (Before Adjust)

Status	Zero		Span	
	Reference (PPB)	Reading (PPB)	Reference (PPB)	Drift% (PPB)
NO	0.0	0.1	400.0	-1.5
NOx	0.0	0.0	400.0	-1.3

### Calibration Report (After Adjust)

Status	Zero		Span	
	Reference (PPB)	Reading (PPB)	Reference (PPB)	Drift% (PPB)
NO	0.0	0.1	400.0	0.0
NOx	0.0	0.0	400.0	0.0



Calibrate By :

Mr. Pasakorn Hmonthong

Approved by :

Mr. Rung Rittayan

## Analyzer Performance Test

Calibrated Date : 01 September 2023

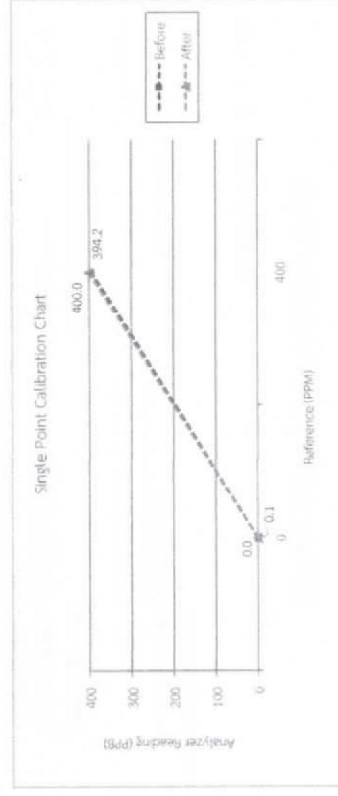
### Instruments Information

Analyzer Type : SO2 Analyzer		Manufacturer : API	
Model : 100A		Serial Number : 1157	
Calibrator Unit		Standard Gas Concentration	
Dilutor Model : Dasibi Model 5008		Nitric Oxide (NO)	
Serial Number : 705		Sulphur Dioxide (SO2)	
ZERO AIR Generator : API MODEL 701		Carbon Monoxide (CO)	
Serial Number : 1924		Cylinder number	
		Expire Date:	

Environment : Temperature 25.5 °C Humidity 51 %RH

### Calibration Report

Status	Zero		Span	
	Reference (PPB)	Reading (PPB)	Reference (PPB)	Drift% (PPB)
Before	0.0	0.1	400.0	-1.5
After	0.0	0.0	400.0	0.0



Calibrate By :

Mr. Pasakorn Hmonthong

Approved by :

Mr. Rung Rittayan



บริษัท เฮลท์ แอนด์ เอ็นไวเทค จำกัด  
Health & Envitech Co., Ltd.

6 ซอยงามวงศ์วาน 5 ตำบลบางเขน กรุงเทพมหานคร 11000  
8 Ngamwongwan Soi 5, Tambon Banghean, Muangnontaburi, Nonthaburi 11000  
Tel (02) 9526305-9 Fax : (02) 9526310, 9589355 www.healthenv.com Email : service@healthenv.com



บริษัท เฮลท์ แอนด์ เอ็นไวเทค จำกัด  
Health & Envitech Co., Ltd.

6 ซอยงามวงศ์วาน 5 ตำบลบางเขน กรุงเทพมหานคร 11000  
8 Ngamwongwan Soi 5, Tambon Banghean, Muangnontaburi, Nonthaburi 11000  
Tel (02) 9526305-9 Fax : (02) 9526310, 9589355 www.healthenv.com Email : service@healthenv.com

## Analyzer Performance Test

Calibrated Date : 01 September 2023

### Instruments Information

Analyzer Type : SO2 Analyzer  
Model : 100AS  
Manufacturer : API  
Serial Number : 2008

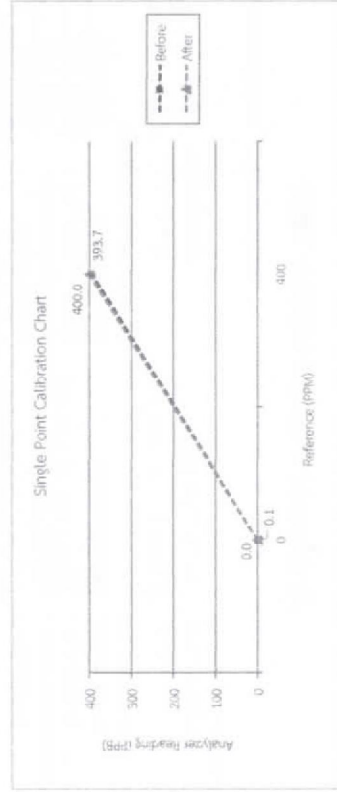
### Calibrator Unit

Dilutor Model : Dasibi Model 5008  
Serial Number : 705  
Serial Number : 705  
ZERO AIR Generator : API MODEL 701  
Serial Number : 1924  
Serial Number : 1924  
Standard Gas Concentration  
Nitric Oxide (NO) 55.54 PPM  
Sulphur Dioxide (SO2) 55.01 PPM  
Carbon Monoxide (CO) 4.533 PPM  
Cylinder number EB0129030  
Expire Date: 29 Oct. 2027

Environment : Temperature 25.5 °C Humidity 51 %RH

### Calibration Report

Status	Reference (PPB)	Zero Reading (PPB)	Drift (PPB)	Reference (PPB)	Span Reading (PPB)	Drift% (PPB)
Before	0.0	0.1	0.1	400.0	393.7	-1.6
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr. Pasakorn Hmonthong

Approved by :

Mr. Rung Rittayan

## Analyzer Performance Test

Calibrated Date : 01 September 2023

### Instruments Information

Analyzer Type : SO2 Analyzer  
Model : 100A  
Manufacturer : API  
Serial Number : 319

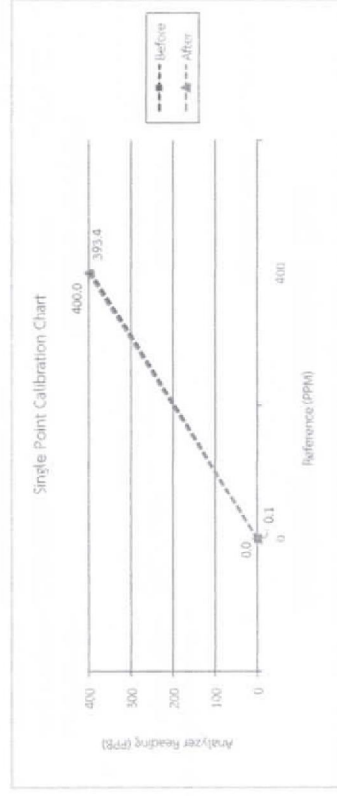
### Calibrator Unit

Dilutor Model : Dasibi Model 5008  
Serial Number : 705  
Serial Number : 705  
ZERO AIR Generator : API MODEL 701  
Serial Number : 1924  
Serial Number : 1924  
Standard Gas Concentration  
Nitric Oxide (NO) 55.54 PPM  
Sulphur Dioxide (SO2) 55.01 PPM  
Carbon Monoxide (CO) 4.533 PPM  
Cylinder number EB0129030  
Expire Date: 29 Oct. 2027

Environment : Temperature 25.5 °C Humidity 51 %RH

### Calibration Report

Status	Reference (PPB)	Zero Reading (PPB)	Drift (PPB)	Reference (PPB)	Span Reading (PPB)	Drift% (PPB)
Before	0.0	0.1	0.1	400.0	393.4	-1.7
After	0.0	0.0	0.0	400.0	400.0	0.0



Calibrate By :

Mr. Pasakorn Hmonthong

Approved by :

Mr. Rung Rittayan





บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด

42 รามอินทรา 14 เขต 9 แขวงจันทบุรี เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด  
ENVIRO SERVICE CO., LTD. 42 Ramindra 14, Zone 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201



บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด

42 รามอินทรา 14 เขต 9 แขวงจันทบุรี เขตบางเขน กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นวีอาร์ เซอร์วิส จำกัด  
ENVIRO SERVICE CO., LTD. 42 Ramindra 14, Zone 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

Calibration Certificate

Date of Issue : 24 October 2023 Page : 1 of 2

Object : Wind speed and wind direction  
Manufacture : NRG Instruments  
Type : Sensor : NRG 4DC, 200P  
Serial No : Basic Datalogger : 309017846  
Customer : Health & Envitech CO.,Ltd.  
6 Ngamwongwan Soi 5, Tumbon Bangkhen, Muangnontaburi, Nontaburi 11000

Calibration Condition : Temperature 25.2 °C Barometric Pressure 1012.8 hPa  
NATIONAL STANDARD WIND TUNNEL : Thermal Anemometer 642 S/N 91563  
: Wind Aloft Plotting Board  
: N.I.S.T. Test Reference Number 731/241460  
: Ultrasonic Anemometer Model DA-650-3TV (sensor TR-90AH)  
Serial Number 110730029 (sensor 120629586)  
JAPAN QUALITY ASSURANCE ORGANIZATION  
: Theodor Friedrich : Dry No. 8390/94 Wet No.  
8389/94  
: Thermosneider No. 918802  
STANDARD THERMOMETER : Digital Barometer Vaisala Type RTB220 No. V1220015  
STANDARD BAROMETER

Calibrated by :

Mr. Pasagorn Samol

Calibrated by :

Mr. Pasagorn Samol

The Result of Calibration

Date of Issue : 24 October 2023 Page : 2 of 2

Standard Ultrasonic Anemometer m/sec	HOOK GAGE NO 1425			TESTED ANEMOMETER		
	Pressure Inches	Vacuum Inches	Pressure hPa	Pressure hPa	Correction hPa	Velocity m/sec
1.00	-	-	-	-	-	0.9
3.02	-	-	-	-	-	2.8
5.04	-	-	-	-	-	4.8
7.03	-	-	-	-	-	6.9
9.01	-	-	-	-	-	8.7
11.03	-	-	-	-	-	10.7
13.01	-	-	-	-	-	12.6
15.03	-	-	-	-	-	14.1
17.05	-	-	-	-	-	16.4
20.02	-	-	-	-	-	19.1

Wind Aloft Plotting Board. U.S. DEPARTMENT OF COMMERCE WEATHER BUREAU	
WIND DIRECTION	TESTED WIND DIRECTION
0	0
90	90
180	180
270	270





# Certificate of Calibration

Certificate Number : SPR24010271-1  
 Customer : Health and Envitech Co., Ltd  
 6 Ngamwongwan Road, Soi 5, Bang Khen, Mueang Nonthaburi,  
 Nonthaburi 11000

Page : 1 of 3

Equipment Name	: Sound Calibrator
Manufacturer	: Quest Technologies
Model	: QC-10
Serial Number	: QE3060101
ID. Number	: SC-001
Environmental Conditions	
Ambient Temperature	: 23 °C ± 3 °C
Relative Humidity	: 50 % ± 15 %
Location of Calibration	: In-Lab
Calibration Procedure	: In-House Method
Received Date	: 18 Jan 2024
Calibration Date	: 22 Jan 2024
Recommend Due Date	: 22 Jan 2025
Date of Issue	: 23 Jan 2024

## Method of Calibration

This certifies that the above instrument was calibrated in compliance with the calibration system requirement of ISO/IEC 17025:2017 in accordance with reference procedure. Standards used to perform this calibration are certified by to NIST or equivalent, National metrology institute, Natural physical constants, consensus standards. The result reported herein apply only to the calibration of the item described above as received. Our decision rule is to contact the customer if the item pass and fail calibration when the results include the uncertainties and the customer must determine if the results meets their needs. The calibration certificate shall not be reproduced except in full, without written approval of SP Metrology System (Thailand).

Calibrated by : Mr. Karoon Pengsalung  
 Calibration Officer  
 Approved by :   
 ( Mr. Yodyaim Chansang )  
 Authorized Signatory



# Calibration Report

Certificate Number : SPR24010271-1

Page : 2 of 3

## Reference Standards

Equipment Name	Model	Serial No.	Certificate No.	Due. Date
Measuring Receiver	8902A	2950A02471	EF-0048-23	14 Nov 2024
AUDIO Analyzer	8903B	3011A09975	EL06303/23	14 Feb 2024

## Traceability

This certification is traceable to the International System of Unit maintained at :  
 NIMT - The National Institute of Metrology, Thailand.  
 PCAL - Professional Calibration & Services Co.,Ltd



Result of Calibration

Certificate No. : SPR24010271-1

Page : 3 of 3

Function : Sound Level

UUC Setting ( ±dB )	Standard Reading ( dB )	Error ( dB )	Uncertainty ( ±dB )
114	113.94	0.06	1.5

Note:

The result of calibration was found accurate as show on date and place of calibration only.  
This Certificate is not certified for any commercial transaction.

Measurement Uncertainty

The reported uncertainty of measurement is the expanded uncertainty obtained by multiplying the standard uncertainty with the coverage factor  $k = 2.00$ , providing a level of confidence approximately 95%.

- End of Certificate -



CERTIFICATE OF CALIBRATION

NO. 20231215045



Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820378
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2023-12-14
Due Date:	2024-12-13



Calibrated by: Jim Lin

- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surplus then, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AN66425-52493
3. Adjustments to indicated sound levels:

Type of Calibrator: B&K 4231 Sound  
Pressure Level: 94.0 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.5	-0.1	1000	0.0	0.0	-0.1
20	-50.3	-6.2	-0.3	2000	0.0	0.0	-0.1
315	-39.4	-3.0	-0.3	4000	1.3	-0.2	-0.1
63	-26.2	-0.9	-0.1	8000	1.1	-0.7	-0.1
125	-16.2	-0.2	-0.1	12500	-5.9	-7.8	0.0
250	-8.6	0.0	-0.1	16000	-11.6	-13.7	0.1
500	-3.2	0.0	-0.1	20000	-23.8	-25.8	-0.6

6. Self-generated noise  
Microphone replaced by electrical input signal device

9.1 dB(A)	10.7 dB(C)	15.0 dB(Z)
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7. FLS Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.4
Deviation of FLS	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB  
Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB  
Max error at 10dB steps below reference sound level 0.1 dB  
Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting) :

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeq-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz) :

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LQpeak-LQ(dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level 112.8 dB  
Sweep amplitude 40 dB  
Scan cycle time 40 S; Measurement period 180 S

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L <sub>avg,T</sub>	103.2	103.2	0.0
L <sub>S</sub>	110.8	110.8	0.0
L <sub>10</sub>	108.8	108.8	0.0
L <sub>50</sub>	92.9	92.8	0.1
L <sub>90</sub>	74.9	74.8	0.1
L <sub>95</sub>	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C  
Relative humidity: 50 %  
Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description	Model	Serial No.	Expiry Date	Traceable To
Microphone	86K 4191	2929405	2024-12-15	NML
Mini function sound calibrator	86K 4226	2288444	2024-10-15	CGISMEC
Signal generator	DS 340	33873	2024-10-15	CEPREI

Test specifications:

- All Scalet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SVI/P004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of +20%.
- The acoustic calibration was performed using an 86K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests





SCARLET | TECH

## CERTIFICATE OF CALIBRATION

NO. 20231215044



3519

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820377
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2023-12-14
Due Date:	2024-12-13



Calibrated by: *Jim Lin*

- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpasses them, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

1. Preliminary inspection: OK
2. Type & serial No. of Microphone: AWA425-S0891
3. Adjustments to indicated sound levels:  
Type of Calibrator: B&K 4231 Sound  
Pressure Level: 94.0 dB

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.6	-0.1	1000	0.0	0.0	-0.1
20	-50.3	-6.1	-0.2	2000	0.1	-0.0	0.0
31.5	-39.3	-2.9	0.0	4000	1.4	-0.1	0.0
63	-26.1	-0.8	0.0	8000	1.2	-0.7	0.0
125	-16.1	-0.1	0.0	12500	-5.8	-7.8	0.0
250	-8.6	0.1	0.0	16000	-11.3	-13.6	0.0
500	-3.1	0.1	0.0	20000	-23.5	-25.8	-0.6

8. Self-generated noise

Microphone replaced by electrical input signal device

7.3 dB(A)	7.8 dB(C)	14.8 dB(Z)
-----------	-----------	------------

7. FBS Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.4
Deviation of FBS	-0.1

8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting)

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAEqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz)

Cycle	One cycle	nominal value	Positive half	Negative half	nominal value
LQpeak-LQ(dB)	3.5	3.5	2.3	2.4	2.4

11. Overload indication: Pass

12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB

Sweep amplitude: 40 dB

Scan cycle time: 40 S, Measurement period: 180 S



Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
L <sub>avg,T</sub>	103.2	103.2	0.0
L <sub>5</sub>	110.8	110.8	0.0
L <sub>10</sub>	108.8	108.8	0.0
L <sub>50</sub>	92.9	92.8	0.1
L <sub>90</sub>	76.9	76.8	0.1
L <sub>95</sub>	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C  
Relative humidity: 50 %  
Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description	Model	Serial No.	Expiry Date	Traceable To
Microphone	BSK 4191	2929405	2024-12-15	N-M-L
Multi function sound calibrator	BSK 4226	2268444	2024-10-15	GTBISMEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

- All Scarlett's Sound Level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMIPO04-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an BSK 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 4672-3 Sound Level Meters Part 3: Periodic tests



CERTIFICATE OF CALIBRATION

NO. 20231215046

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	8203779
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2023-12-14
Due Date:	2024-12-13



Calibrated by:

- This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlett Tech Co Ltd Taiwan.

- Preliminary inspection: OK
- Type & serial No. of Microphone: AWA4402-S1026
- Adjustments to indicated sound levels:

4. Measuring up limit: 140 dBA

5. Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Type of Calibrator BSK 4231 Sound  
Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditional) 93.8 dB

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.5	-0.1	1000	0.0	0.0	-0.1
20	-50.3	-6.1	-0.3	2000	0.1	0.0	0.0
315	-39.4	-2.9	0.0	4000	1.3	-0.1	0.0
63	-26.1	-0.8	-0.1	8000	1.2	-0.7	0.0
125	-16.1	-0.2	0.0	12500	-5.8	-7.8	0.0
250	-8.6	0.0	0.0	16000	-11.3	-13.7	0.1
500	-3.2	0.1	0.0	20000	-23.2	-25.8	-0.6

6. Self-generated noise

Microphone replaced by electrical input signal device

91 dBA	10.4 dB(C)	15.7 dB(Z)
--------	------------	------------

7. FRS Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.4
Deviation of FRS	-0.1

8. Level Uncertainty (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB

Max error at 10dB steps upper reference sound level 0.1 dB

Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB

Max error at 10dB steps below reference sound level 0.1 dB

Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

9. Tone burst response (A Weighting)

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

10. Peak C sound level (500Hz)

Cycle	One cycle	nominal value	Positive half	nominal value	Negative half	nominal value
LPeak-LC(dB)	3.5	3.5	2.3	2.4	2.3	2.4

11. Overload indication

12. Statistical analysis function

Sweep signal maximum indicated sound level:112.8 dB

Sweep amplitude:40 dB

Scan cycle time: 60 S; Measurement period: 180 S.

Items	Measured value/dB	Theoretical calculated value/dB	Error/dB
LAeq,T	103.2	103.2	0.0
LS	110.8	110.8	0.0
LI0	108.8	108.8	0.0
LS0	92.9	92.8	0.1
LS0	76.9	76.8	0.1
LS5	75.0	74.9	0.1

Uncertainty of measurement results: 0.4 dB (k=2)

Environment conditions:

Air temperature: 20 °C  
Relative humidity: 50 %  
Static pressure: 101.8 kPa

Reference equipment used in the calibration:

Description	Model	Serial No.	Expiry Date	Traceable To
Microphone	B&K 4191	2979405	2024-12-15	NML
Multi function sound calibrator	B&K 4226	2288444	2024-10-15	CIGIS-NEC
Signal generator	DS 360	33873	2024-10-15	CEPREI

Test specifications:

- All Scalet's Sound level Meter has been calibrated in accordance with the requirements as specified in ISO 17025 and the lab calibration procedure SMTP004-CA-152.
- The electrical tests were performed using an electrical signal substituted for the microphone which was removed and replaced by an equivalent capacitance within a tolerance of ±20%.
- The acoustic calibration was performed using an B&K 4226 sound calibrator and corrections was applied for the difference between the free-field and pressure responses of the Sound Level Meter.

References:

IEC 61672-3 Sound Level Meters Part 3: Periodic tests



SCARLET TECH



## CERTIFICATE OF CALIBRATION

NO. 20231215041

Name of Product:	Sound Level Meter
Model:	ST-11D
Serial Number:	820372
Specification:	Class 1
Conclusion:	Pass
Date of calibration:	2023-12-14
Due Date:	2024-12-13



Calibrated by:

Jim Lin

- This report certifies that all calibration equipment used in the test is traceable with the Internal (ISO9001) procedures and meets all specification given in the Manual(s) or respectively surpass; then, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech Co Ltd Taiwan.

- Preliminary inspection: OK
- Type & serial No. of Microphone: ANNA425-52842
- Adjustments to indicated sound levels:  
Type of Calibrator B&K 4231 Sound  
Pressure Level 94.0 dB
- Measuring up limit: 140 dBA
- Frequency weightings (Acoustic signal tests for Z weighting, other electric signal tests.)

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB

Nominal frequency / Hz	Frequency weighting / dB			Nominal frequency / Hz	Frequency weighting / dB		
	A	C	Z		A	C	Z
10	-71.1	-14.6	-0.2	1000	0.0	0.0	-0.1
20	-50.3	-6.1	-0.4	2000	0.1	-0.0	0.0
31.5	-39.5	-3.0	-0.2	4000	1.3	-0.1	0.0
63	-26.2	-0.8	-0.1	8000	1.2	-0.7	0.0
125	-16.2	-0.2	0.0	12500	-5.6	-7.8	0.0
250	-8.6	0.0	0.0	16000	-11.7	-13.7	0.1
500	-3.2	0.0	0.0	20000	-23.8	-25.9	-0.6

### 6. Self-generated noise

Microphone replaced by electrical input signal device

9.6 dB(A)	10.4 dB(C)	14.5 dB(Z)
-----------	------------	------------

### 7. FGS Weighting

Rate of the F weighting decrease (dB/s)	35.2
Rate of the S weighting decrease (dB/s)	4.2
Deviation of FGS	0.0

### 8. Level Linearity (A-weighting at frequency 1 kHz)

Reference sound level 90.0 dB  
Max error at 10dB steps upper reference sound level 0.1 dB  
Max error at 1dB steps within 5dB of the upper limit linear operating range 0.0 dB  
Max error at 10dB steps below reference sound level 0.1 dB  
Max error at 1dB steps within 5dB upper the lower limit linear operating range 0.1 dB

### 9. Tone burst response (A Weighting)

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	0.0	-4.0	-2.9	-7.0
200	-1.0	-7.4	-6.9	-7.0
2	-18.1	-26.9	-26.9	-7.0
0.25	-27.2	/	-36.0	-7.0

### 10. Peak C sound level (500Hz)

Cycle	One cycle	nominal value	Positive half	Negative half	nominal value
LDpeak-LC(dB)	3.5	3.5	2.3	2.3	2.4

### 11. Overload indication

Pass

### 12. Statistical analysis function

Sweep signal maximum indicated sound level: 112.8 dB  
Sweep amplitude: 40 dB  
Scan cycle time: 60 S; Measurement period: 180 S



Nomenclature

$P_b$  - Barometric Pressure  
 DGM - Dry Gas Meter  
 $K_1$  - Constant based on standard temp and press  
 $\Theta$  - Run time, in minutes  
 $P_m$  -  $\Delta H$  (Meter Pressure, gauge)  
 $V_m$  - Volume collected by test meter, corrected for STP  
 $Q_{m(std)}$  - Calculated flow rate of test meter  
 $K$  - Critical orifice coefficient  
 $P_w$  - Measured pressure of reference meter  
 $t_w$  - Temperature measured in reference meter

Equations

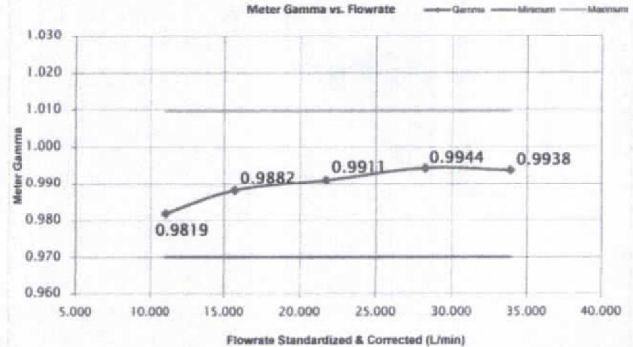
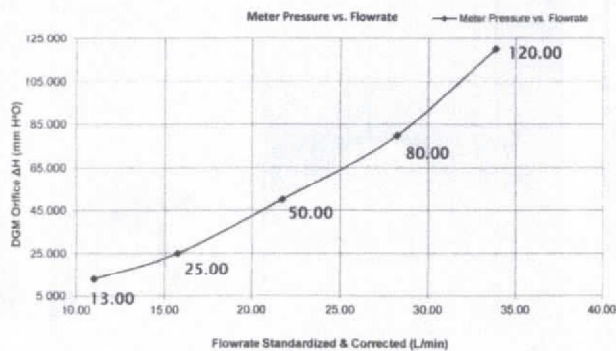
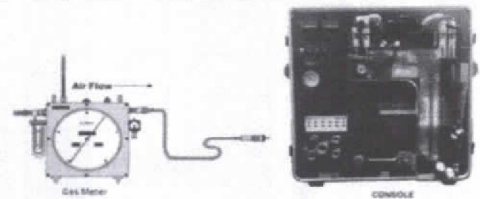
$$V_{w(std)} = Y * K_1 \frac{V_w * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_w}$$

$$V_{m(std)} = \frac{K_1 V_w (P_{bar} + \frac{\Delta H}{13.6})}{T_m}$$

$$K_1 = \frac{T_{std}}{P_{std}} \quad Y = \frac{V_{w(std)}}{V_{m(std)}} \quad Q_{w(std)} = \frac{V_{w(std)}}{\Theta}$$

$$\Delta H_{ref} = \frac{P_{m(std)} * 0.0011606 * (P_{bar} + \frac{P_{m(std)}}{13.6})}{T_m} * \left( \frac{T_w + \Theta}{V_w + P_{bar}} \right)^2$$

Calibration Train



UUT Meter Console Information

Model #: XC-572-OV  
 Serial #: 1204012  
 DGM Model #: G1.6  
 DGM Serial #: 2012-006454

Calibration Conditions

Bar. Pressure (mm Hg): 756.8  
 Ambient Temperature (°C): 24.7  
 Relative Humidity (%): 51.0  
 Altitude (m): 1.83  
 Bar. Pressure Corr. (mm Hg): 756.7

Factors/Conversions

Std. Temp. (K): 293.15  
 Std. Press. (mm Hg): 760  
 $K_1$  (K/mm Hg): 0.3857

Reference Equipment

Calibration Meter Model: DGMR-200H  
 Cal. Due Date: 25-Jul-24  
 Serial No.: 0000026  
 Gamma: 1.0000

UUT Meter (DGM)

Run Time (minutes)	Orifice, $\Delta H$ (mm H2O)	Volume			Meter Temperature (°C)		Meter Pressure (mm H2O)	Volume (L)			Outlet Temperature (°C)	
		Initial (L)	Final (L)	Total (L)	Initial	Final		Initial	Final	Total	Initial	0.00
840.00	13.00	338514.6	338674.4	159.8	24.0	24.0	0.3	0.00	156.99	156.99	24.0	24.0
600.00	25.00	338674.4	338836.0	161.6	24.0	24.0	0.5	0.00	159.88	159.88	24.0	24.0
455.00	50.00	338836.0	339005.2	169.2	25.0	26.0	0.6	0.00	167.42	167.42	24.0	24.0
350.00	80.00	339005.2	339173.8	168.6	26.0	27.0	2.0	0.00	166.72	166.72	24.0	24.0
300.00	120.00	339173.8	339347.0	173.2	27.0	27.0	2.4	0.00	171.38	171.38	24.0	24.0

Reference Meter (WTM)

Standardized Data

Reference Meter (L)		UUT Meter (L)		Correction Factor		$\Delta H$ @ (mm H2O)	
Std. Vol.	Std. Flow	Std. Vol.	Std. Flow	Value	Variance	$\Delta H$ @	Variance
$V_{w(std)}$	$Q_{w(std)}$	$V_{m(std)}$	$V_{w(std)}$	Y	$\Delta Y$	$\Delta H$ @	$\Delta \Delta H$ @
154.31	11.02	157.15	11.0	0.9819	-0.0080	47.5	1.219
157.23	15.72	159.11	15.7	0.9882	-0.0017	45.0	1.296
164.68	21.72	166.16	21.7	0.9911	0.0012	47.1	0.786
164.57	28.21	165.49	28.2	0.9944	0.0045	45.0	-1.372
169.33	33.87	170.38	33.9	0.9938	0.0039	47.0	0.863
				0.9899	= Y Avg.	46.3	= $\Delta H$ @ Avg. Metric

Note: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter, acceptable tolerance of individual values from the average is  $\pm 0.02$ .  
 Note: For  $\Delta H$ , orifice pressure differential that equates to 0.0212mm/min at standard temperature and pressure, acceptable tolerance of individual values from the average is  $\pm 0.2$  inches (5.1mm) H<sub>2</sub>O

Pass/Fail Judgment :

Pass

Calibrate By: D. P.

Approved By: [Signature]

Date: 29 Aug 23

The instruments listed and described on this certificate have been calibrated against standards traceable to the National Institute of Standards and Technology (NIST) and in reference to EPA Method 5, Section 10.3.1



### Console Information

Model #: XC-572-OV  
Serial #: 1204012  
Units: Metric

### Calibration Conditions

Pbar (mm. Hg): 756.8  
Humidity (%): 51  
Temp (°C): 24.7  
Elevation (m): 1.6  
Corr. Pbar (mm. Hg): 756.7

### Reference Devices

TC Simulator Model: CC-VTR-SH  
Reference #: 091109269  
Barometer Model: 736930  
Reference #: EBARODIALSPE01  
Pressure Model: 718 30G  
Reference #: 9543013

### Temperature Display Calibration Data

Test Thermocouple Calibrations									
Reference Point #	Aux °C	Stack °C	Probe °C	Oven °C	Filler °C	Exit °C	Reference Point Status <sup>2</sup>		
1	-18	-18	-17	-17	-17	-18	PASS		
2	38	37	37	36	36	37	PASS		
3	93	92	92	92	92	92	PASS		
4	149	148	148	148	148	148	PASS		
5	260	259	258	258	259	259	PASS		
6	371	370	370	370	370	370	PASS		
7	482	481	480	480	480	481	PASS		
8	593	592	591	591	592	592	PASS		
9	816	815	814	814	814	815	PASS		
10	1038	1038	1037	1037	1037	1038	PASS		
								Overall Audit Status	
								PASS	

### NIST Reference Thermocouple ID:

Ref Point #	Theoretical Temp °C	DGM Thermocouple Sensor Reading °C	$\Delta T_{\text{sen}}$ °C
1	0.9	1	0.04%
2	24.7	24	0.14%

Maximum<sup>3</sup>

Status

PASS

Measured Temperature Thermocouples are not subject to EPA standards, and should not be used as an official reference for ambient temperature

Calibrate By: *Deanna P.*

Approved By: *M*

Date: 29 Aug 23

### Notes

<sup>1</sup>For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>2</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>3</sup>Do not change the cell value. It is instead based on input from Cell Hg at the top of this sheet under "Calibration Conditions".

<sup>4</sup>For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.

<sup>5</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.

<sup>6</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.

### Console Information

Model #: XC-572-OV  
Serial #: 1204012  
Units: Metric  
Type: "English"

### Calibration Conditions

Pbar (mm. Hg): 756.8  
Humidity (%): 51.0  
Temp (°C): 24.7  
Corr. Pbar (mm. Hg): 756.7

### Reference Devices

TC Simulator Model: CC-VTR-SH  
Reference #: 091109269  
Barometer Model: 736930  
Reference #: EBARODIALSPE01  
Digital Pressure Calibrator Model: 718 30G  
Reference #: 3691001

### Pressure Gauge / Manometer Calibration Data

Console Vacuum Calibration				
Reference Point #	Reference Vacuum in. Hg	Console Vacuum in. Hg	Reference Point Status <sup>2</sup>	
1	-5.0	-5.0	PASS	
2	-15.0	-15.0	PASS	
3	-20.0	-20.0	PASS	

ΔH Manometer Calibration				
Reference Point #	Reference mm H2O	Positive (+) Pitot mm H2O	Negative (-) Pitot mm H2O	Reference Point Status <sup>2</sup>
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
				ΔH Overall Audit Status
				PASS

ΔP Manometer Calibration				
Reference Point #	Reference mm H2O	Positive (+) Pitot mm H2O	Negative (-) Pitot mm H2O	Reference Point Status <sup>2</sup>
1	-200.000	0.0	-200.0	PASS
2	-150.000	0.0	-150.0	PASS
3	-100.000	0.0	-100.0	PASS
4	-80.000	0.0	-80.0	PASS
5	-50.000	0.0	-50.0	PASS
6	0.000	0.0	0.0	PASS
7	50.000	50.0	0.0	PASS
8	80.000	80.0	0.0	PASS
9	100.000	100.0	0.0	PASS
10	150.000	150.0	0.0	PASS
11	200.000	200.0	0.0	PASS
				ΔP Overall Audit Status
				PASS

Calibrate By: *Deanna P.*

Approved By: *M*

Date: 29 Aug 23

<sup>1</sup>Suggested: minimum reference points are 10 (0, 100, 200, 300, 400, 500, 600, 700, 800, 900, 1000, 1500, 2000 °F), can test for more.  
<sup>2</sup>For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>3</sup>Do not change the cell value. It is instead based on input from Cell Hg at the top of this sheet under "Calibration Conditions".  
<sup>4</sup>Absolute temperature difference and other formulas are calculated based on input from Cell Hg at the top of this sheet under "Calibration Conditions".  
<sup>5</sup>For valid test results, the maximum difference between console and reference barometric pressure readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>6</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>7</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>8</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>9</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>10</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.  
<sup>11</sup>For valid test results, the maximum difference between console and reference vacuum readings should be less than 0.5 in. Hg (12.5 mm Hg). EPA Method 5, Section 6.1.2.







## Nozzle Validation

### Sampling System Equipment Information

Console Model	XC-572-OV
Console Number	1204012
DGM Model	G1.8
DGM Number	2012-006454

### Validation Conditions

Digital Calipers	CD-15APX
Reference No	A22070181
Temperature	24.7 °C±3
Barometric Pressure	756.8 mm Hg

Nozzle ID	Validation Data				Results	
	Nozzle Diameter				Different	(D <sub>1</sub> + D <sub>2</sub> + D <sub>3</sub> ) / 3
Sizes	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>avg</sub>	ΔD	
	mm	mm	mm	mm	mm	mm
4	3.17	3.16	3.16	3.16	0.000	3.160
6	4.77	4.73	4.74	4.73	0.006	4.733
8	6.35	6.34	6.35	6.347	0.006	6.347
10	7.92	7.91	7.90	7.903	0.006	7.903
12	9.52	9.47	9.47	9.470	0.000	9.470
14	11.09	11.04	11.02	11.033	0.012	11.033
16	12.70	12.70	12.70	12.700	0.000	12.700

Where:

D1, D2, D3 = Three difference nozzle diameters, mm; diameter must be within 0.025 mm

ΔD = Maximum difference between any two diameters, must be ≤ 0.100 mm

D avg = (D<sub>1</sub> + D<sub>2</sub> + D<sub>3</sub>) / 3



Validation By:

*Deep P.*

Approved By:

*[Signature]*

Date:

29 Aug 23

**neediss**  
Neediss Supply Instrument Co., Ltd.



บริษัท เอ็นวีวี เซอร์วิส จำกัด

42 ซอยอินทรี 14 หมู่ 9 แขวงคลองตัน เขตคลองเตย กรุงเทพฯ 10720 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
สาขาบริการภาคใต้ 42 Raminthra 14 year 9, Tha Klang, Bangkok, Bangkok 10210 Tel: 02-9435814-5 Fax: 02-9438201  
ENVIAS SERVICE CO., LTD.

### Analyzer Performance Test

Calibrated Date: 26 June 2023

### Instruments Information

Analyzer Type: SO2 Analyzer Model: 42C	Manufacturer: Thermo Environmental SIN: 43CHL-55690-324
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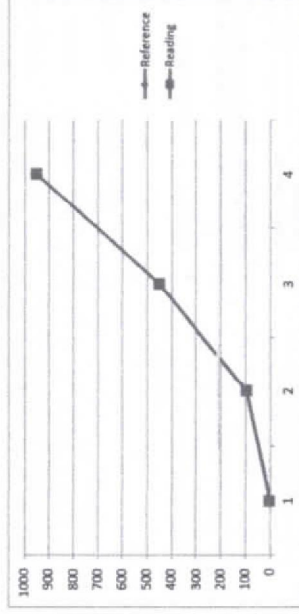
### Calibration System

Dilutor Model: Dasig Model 5008 SIN: 705 ZERO AIR Generator API Model 701 SIN: 1924	Standard Gas NO Conc 957.2 PPM SO2 Conc 960.7 PPM CO Conc 960.4 PPM Expire Date: 29-Oct-27
--	--

Environment: Temperature 25.5 °C Humidity 51 %RH

### CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS		
	Reference	Reading	%ERROR
ZERO	0	0	0.00
1	95	94.1	-0.90
2	450	450	0.00
3	950	950.6	0.06
			0.22



Calibrate By: *[Signature]*  
MR. PASAGORN SAMOL



บริษัท เอ็นวีเอ เซอร์วิส จำกัด

42 รามอินทรา 14 ยอ 9, ถนนรามอินทรา แขวง ร่มเกล้า เขต รามอินทรา 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นวีเอ เซอร์วิส จำกัด  
ENVIA SERVICE CO., LTD. 42 Ramindra 14 yolk 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201



บริษัท เอ็นวีเอ เซอร์วิส จำกัด

42 รามอินทรา 14 ยอ 9, ถนนรามอินทรา แขวง ร่มเกล้า เขต รามอินทรา 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
บริษัท เอ็นวีเอ เซอร์วิส จำกัด  
ENVIA SERVICE CO., LTD. 42 Ramindra 14 yolk 9, The Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

1. ข้อมูล Analyzer Calibration Error

Certified conc of calibration gas; $C_v$ (ppm)	Measured concentration of calibration gas; $C_{bw}$ (ppm)	$ C_v - C_{bw} $ (ppm)	$ACE = \frac{ C_v - C_{bw} }{C_v} (100)$ (%)
Low 95	94.10	0.90	0.95
Mid 450	450.00	0.00	1.00
High 950	950.60	0.60	0.00

สรุปผลการทดสอบ

ความผิดพลาดของการสอบเทียบ (Analyzer (Direct) calibration error; ACE)

<input checked="" type="checkbox"/> ผ่าน $\leq \pm 5\%$	
<input type="checkbox"/> ไม่ผ่าน $> \pm 5\%$	

2. ข้อมูลการเปรียบเทียบเครื่องมือวัดก๊าซมาตรฐานที่ระดับความเข้มข้นค่า กลาง หรือความเข้มข้นสูง (Initial Analyzer Calibration) และ System Bias Error

Calibration gas level (ppm)	Initial values				Final values		
	$C_{bw}$ (ppm)	System response time (Second)	Measured concentration of calibration gas (System); $C_i$ (ppm)	$SB_i = \frac{ C_i - C_{bw} }{C_i} (100)$ (%)	$C_i$ (ppm)	$SB_i$ (%)	Drift $m_i - m_i$ (%)
Low level 95	94.10	300	95.05	1.00	95.40	1.37	0.37
High or mid level 950	950.60	300	950	0.06	950.20	0.04	0.02

1. ข้อมูล Analyzer Calibration Error

Certified conc of calibration gas; $C_v$ (ppm)	Measured concentration of calibration gas; $C_{bw}$ (ppm)	$ C_v - C_{bw} $ (ppm)	$ACE = \frac{ C_v - C_{bw} }{C_v} (100)$ (%)
Low 95	95.05	0.05	0.05
Mid 450	451.00	1.00	1.00
High 950	950.50	0.50	0.00

สรุปผลการทดสอบ

ความผิดพลาดของการสอบเทียบ (Analyzer (Direct) calibration error; ACE)

<input checked="" type="checkbox"/> ผ่าน $\leq \pm 5\%$	
<input type="checkbox"/> ไม่ผ่าน $> \pm 5\%$	

2. ข้อมูลการเปรียบเทียบเครื่องมือวัดก๊าซมาตรฐานที่ระดับความเข้มข้นค่า กลาง หรือความเข้มข้นสูง (Initial Analyzer Calibration) และ System Bias Error

Calibration gas level (ppm)	Initial values				Final values		
	$C_{bw}$ (ppm)	System response time (Second)	Measured concentration of calibration gas (System); $C_i$ (ppm)	$SB_i = \frac{ C_i - C_{bw} }{C_i} (100)$ (%)	$C_i$ (ppm)	$SB_i$ (%)	Drift $m_i - m_i$ (%)
Low level 95	95.05	300	95.05	0.00	95.40	0.37	0.37
High or mid level 950	950.50	300	950	0.05	950.20	0.03	0.02





บริษัท เอ็นวีวี เซอร์วิส จำกัด

42 รามอินทรา 14 แขวง 9 เขตจตุจักร กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
E-mail: envia@envia-service.co.th envia-service.co.th 42 Ramindha 14 yek 9, Tha Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

#### สรุปผลการทดสอบ

ค่า bias เริ่มต้นของระบบ (Initial system bias check; SB<sub>i</sub>)

<input checked="" type="checkbox"/>	ค่า $\leq \pm 5\%$
<input type="checkbox"/>	ค่า $> \pm 5\%$

ค่า bias หลังการตรวจวัด (Post run system bias check; SB<sub>p</sub>)

<input checked="" type="checkbox"/>	ค่า $\leq \pm 5\%$
<input type="checkbox"/>	ค่า $> \pm 5\%$

การประเมินค่า Drift (Drift assessment)

<input checked="" type="checkbox"/>	ค่า $\leq \pm 3\%$
<input type="checkbox"/>	ค่า $> \pm 3\%$



บริษัท เอ็นวีวี เซอร์วิส จำกัด

42 รามอินทรา 14 แขวง 9 เขตจตุจักร กรุงเทพมหานคร 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
E-mail: envia@envia-service.co.th envia-service.co.th 42 Ramindha 14 yek 9, Tha Rang, Bangkok, Bangkok 10230 Tel : 02-9435814-5 Fax : 02-9438201

#### Analyzer Performance Test

Calibrated Date: 26 June 2023

#### Instruments Information

Analyzer Type: NOx Analyzer Model: 42C	Manufacturer: Thermo Environmental S/N: 42CXL-052/613257
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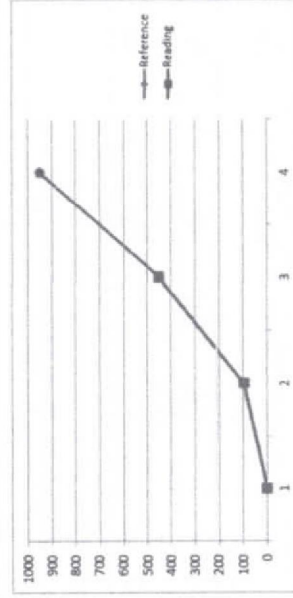
#### Calibration System

Calibrator Unit	Standard Gas
Dilutor Model: Dasta Model 5008 S/N: 705	NO Conc 957.2 PPM
ZERO AIR Generator API MODEL 701 S/N: 1924	SO <sub>2</sub> Conc 960.7 PPM
	CO Conc 960.4 PPM
	Expire Date: 29-Oct-27

Environment: Temperature 25.5 °C Humidity 51 %RH

#### CALIBRATION RESULTS

POINT NO	CALIBRATION RESULTS			
	Reference	Reading	ERROR	%ERROR
ZERO	0	0	0.00	0.00
1	95	95.05	0.05	0.05
2	450	451	1.00	0.22
3	950	950.5	0.50	0.05
				0.08



Calibrate By: Mr. PASAGORN SAMOL



บริษัท เอ็นวีวี เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 เขต 9 แขวงสามเวิ้ง เขตหนองแขม กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
ENVIA SERVICE CO., LTD. 42 Ramithra 14 yek 9, The Rang, Bangkhon, Bangkok 10230 Tel: 02-9435814-5 Fax: 02-9438201



บริษัท เอ็นวีวี เซอร์วิส จำกัด

42 ถนนมิตรภาพ 14 เขต 9 แขวงสามเวิ้ง เขตหนองแขม กรุงเทพฯ 10230 โทรศัพท์ 02-9435814-5 โทรสาร 02-9438201  
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1. ข้อมูล Analyzer Calibration Error

Certified conc of calibration gas; $C_v$ (ppm)	Measured concentration of calibration gas; $C_m$ (ppm)	$ C_v - C_m $ (ppm)	$ACE = \frac{ C_v - C_m }{C_v} (100)$ (%)
Low 95	95.05	0.05	0.05
Mid 450	451.00	1.00	1.00
High 950	950.50	0.50	0.00

สรุปผลการทดสอบ

ความผิดพลาดของการสอบเทียบ (Analyzer (Direct) calibration error; ACE)

<input checked="" type="checkbox"/> ผ่าน $\leq \pm 5\%$
<input type="checkbox"/> ไม่ผ่าน $> \pm 5\%$

2. ข้อมูลการเปรียบเทียบเครื่องมือวัดที่มาตรฐานเพื่อวัดความเข้มข้นค่ากลาง หรือความเข้มข้นสูง (Initial Analyzer Calibration) และ System Bias Error

Calibration gas level (ppm)	Initial values				Final values		
	$C_{av}$ (ppm)	System response time (Second)	Measured concentration of calibration gas (System); $C_s$ (ppm)	$SB_i = \frac{ C_s - C_{av} }{C_{av}} \times 100$ (%)	$C_s$ (ppm)	$SB_f$ (%)	Drift $ SB_i - SB_f $ (%)
Low level 95	95.05	300	95.05	0.00	95.40	0.37	0.37
High or mid level 950	950.50	300	950	0.05	950.20	0.03	0.02

สรุปผลการทดสอบ

ค่า bias เริ่มต้นพอรับได้ (Initial system bias check; SB<sub>i</sub>)

<input checked="" type="checkbox"/> ผ่าน $\leq \pm 5\%$
<input type="checkbox"/> ไม่ผ่าน $> \pm 5\%$

ค่า bias หลังการตรวจวัด (Post run system bias check; SB<sub>f</sub>)

<input checked="" type="checkbox"/> ผ่าน $\leq \pm 5\%$
<input type="checkbox"/> ไม่ผ่าน $> \pm 5\%$

การประเมินค่า Drift (Drift assessment)

<input checked="" type="checkbox"/> ผ่าน $\leq \pm 3\%$
<input type="checkbox"/> ไม่ผ่าน $> \pm 3\%$



**Inctech Metrological Center Co.,Ltd.**  
39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,  
Salmal, Bangkok 10220, Thailand  
Tel. (662) 909-8820 (Auto 10 lines) [www.imcinstrument.com](http://www.imcinstrument.com)



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39/1 Soi 82, Sukhapiban 5 Rd., O ngoen,  
Salmal, Bangkok 10220, Thailand  
Tel. (662) 909-8820 (Auto 10 lines) [www.imcinstrument.com](http://www.imcinstrument.com)

## Certificate of Calibration

Certificate No. : MC23-2564  
Page : 1 of 2

**Customer** : Health & Envitech Co., Ltd.  
**Address** : 77/11 M. 2 Ngamwongwan Rd., Soi 5, T. Bangkhen, A. Muang Nontaburi 11000

**Description** : Personal Sampler Calibrator  
**Manufacturer** : SKC  
**Model** : 303  
**Serial No.** : N/A  
**Identification No.** : PC-001  
**Calibration Place** : Chemical Laboratory 2

**Order No.** : 3717/23  
**Received date** : Nov 20, 2023  
**Calibration date** : Nov 22, 2023  
**Environment Condition** :  
**Temperature** : ( 20+/- 2 ) °C  
**Humidity** : ( 50+/- 15 ) %RH

**Calibration Method** : Calibration were conducted using In-house calibration procedure CP-MC-004 According to comparison with Analytical Balance. The calibration methods based on ASTM E542-01.

### Reference Standard Instruments :

Instrument	Model	Serial No.	Certificate No.	Due Date
Analytical Balance	AE-FA220	201907106	MM23-2635	Aug 07, 2024
Humidity / Baro / Temp. Data Recorder	MHB-382SD	N/A	MT23-4860	Jul 25, 2024
Digital Thermometer	EFT-4	EFT42020033	MT23-3227	May 01, 2024

This result of calibration was found accurate as shown on date and place of calibration only.

**Traceability** : This measurement are traceable to the International System of Unit (SI), through  
National Institute of Metrology Thailand ( NIMT )

The reported uncertainty of measurement was based on standard uncertainty multiplied by coverage factor  $k = 2$ , providing a level of confidence of not less than 95%



**Calibrated by** : Miss Nuengruethai Siripoch  
**Issue date** : Nov 22, 2023

**Approved by** :   
(Mr. Panuwat Phukian)

This calibration certificate shall not be reproduced other than in full except with the prior written approval of Inctech Metrological Center Co.,Ltd

**Result** : Without adjustment  
**Calibration Point** : 50, 90, 100, 110 ml

Nominal value ( ml )	Standard reading ( ml )	UUC* correction ( ml )	Uncertainty of measurement ( +/- ml )
50	50.0192	0.0192	0.056
90	90.0227	0.0227	0.063
100	100.0279	0.0279	0.063
110	110.0287	0.0287	0.073



# Certificate of Calibration

NO. 20230328102

Name of Product:	Sound Level Meter
Model:	ST-25D
Manufacturer:	Scarlet Tech Co., Ltd.
Serial Number:	10340875
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2023-03-28
Due Date:	2024-03-27

Calibrated by:

*Jim Lin*



- This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass then, and applies only to the unit identified above.
- This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech.

- Preliminary inspection: OK
- Type & serial No. of Microphone: AWA14421 – A000175
- Adjustments to indicated sound levels:  
Type of Calibrator B&K 4231  
Sound Pressure Level 94.0 dB  
Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB.
- Measuring up limit: 138 dBA.
- Frequency weighting (Acoustic signal tests for Z weighting, other electric signal tests)

Nominal frequency /Hz	Frequency weighting / dB			Nominal frequency /Hz			Frequency weighting / dB		
	A	C	Z				A	C	Z
20	-50.8	-6.4	0.3	1000			0.0	0.0	0.0
315	-39.7	-3.2	0.1	2000			1.2	-0.2	0.0
63	-26.3	-0.8	0.1	4000			1.0	-0.8	0.0
125	-16.2	-0.2	0.0	8000			-1.0	-2.9	0.0
250	-8.7	0.0	0.0	12500			-4.1	-6.0	0.0
500	-3.3	0.0	0.0	/			/	/	/

## 6. Self-generated noise

Microphone installed: 37.4 dBA

Microphone replaced by electrical input signal device

23.1 dB (A)	33.9 dB (C)	40.8 dB (Z)
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## 7. F&S Weighting

Rate of the F weighting decrease (dB/s)	34.9
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	0.0

## 8. Level Linearity (A-weighting at frequency 1 kHz)

(Total measuring range: 33 dBA - 138 dBA, frequency 1 kHz):

Reference level range (frequency 1 kHz):

① 10 dB Interval

Signal	37.0	44.0	54.0	64.1	74.0	84.0	94.0	104.0	114.0	124.0	134.0
Indicating value dB(A)	37.0	44.0	54.0	64.1	74.1	84.0	94.0	103.9	114.0	124.2	134.1
Full scale deviation (dB)	0.0	0.0	0.0	0.0	0.1	0.0	0.0	-0.1	0.0	0.2	0.1

Max error at 10 dB Interval 0.2 dB

②1 dB Interval

Upper Limit	134.0	135.0	136.0	137.0	138.0
Indicating value dB(A)	134.1	135.0	136.0	137.1	138.0
Full scale deviation (dB)	0.1	0.0	0.0	0.1	0.0
Lower Limit	33.0	34.0	35.0	36.0	37.0
Indicating value dB(A)	33.1	34.1	35.1	36.0	37.0
Full scale deviation (dB)	0.1	0.1	0.1	0.0	0.0

Max error at 1 dB- 10 dB Interval 0.2 dB

#### 9. Tone burst response (A Weighting)

Single Toneburst duration /ms	Toneburst response /dB				
	LAFmax-LA	LASmax-LA	LAEL-LA	LAeqT-LA	
500	-0.1	-4.0	-3.1	-7.0	
200	-1.0	-7.5	-7.0	-7.0	
2	-18.0	-27.1	-27.1	-7.1	
0.25	-27.1	/	-36.1	-7.1	

#### 10. Overload indication: Pass

#### 11. C-weighting peak sound level

Number of cycles in test signals	Nominal frequency of test signal/Hz	(LCpeak-LC)/dB		tolerance limits : class 2/dB
		Reference level range	Reference difference	
		4dB low of upper limit		
one	31.5	3.0	2.5	±3.0
one	500	3.6	3.5	±2.0
one	8000	3.5	3.4	±3.0
Positive half cycle	500	2.3	2.3	±2.0
negative half cycle	500	2.2	2.3	±2.0

#### 12. Statistical analysis function

Indicated sound level of sweep signal maximum: 120 dB

Sweep amplitude: 40 dB

Measurement period: 60 s; Measurement duration: 180 s

Index	(dB)		
	SLM Reading	Expected Reading	Deviation
LAeq	110.4	110.4	0.0
L5	118.0	118.0	0.0
L10	116.0	116.0	0.0
L50	99.9	100.0	-0.1
L90	84.0	84.0	0.0
L95	82.0	82.0	0.0

13. SD card function: Pass

References:

- IEC 61672-1:2013 Electroacoustics-Sound Level Meters - Part 1: Specifications
- IEC 61260-1:2014 Electroacoustics-Octave-band and fractional-octave-band filters - Part 1: Specifications
- IEC 61252:2017 Electroacoustics-Specifications for personal sound exposure meters

Environment conditions:

Air temperatura: 20 °C Relative humidity: 55 % Static pressure: 102.2 kPa

Certificate of Calibration

NO. 20230328008

Name of Product:	Sound Level Meter
Model:	ST-25D
Manufacturer:	Scarlet Tech Co., Ltd.
Serial Number:	10340883
Specification:	Class 2
Conclusion:	Pass
Date of calibration:	2023-03-28
Due Date:	2024-03-27

Calibrated by:

Jim Lin



- I. This report certifies that all calibration equipment used in the test is traceable with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass then, and applies only to the unit identified above.
- II. This certificate is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
- III. This certificate of calibration shall not be reproduced except in full, without written permission of the Scarlet Tech.



1. Preliminary inspection: OK

2. Type & serial No. of Microphone: AWA14421 – A000102

3. Adjustments to indicated sound levels:

Type of Calibrator B&K 4231

Sound Pressure Level 94.0 dB

Equivalent Free-field Sound Level (reference environment conditions) 93.8 dB.

4. Measuring up limit: 138 dBA.

5. Frequency weighting (Acoustic signal tests for Z weighting, other electric signal tests)

Nominal frequency /Hz	Frequency weighting / dB			Frequency weighting / dB		
	A	C	Z	A	C	Z
20	-50.7	-6.3	0.3	0.0	0.0	0.0
31.5	-39.6	-3.1	0.1	1.2	-0.1	0.0
63	-26.3	-0.9	0.1	1.0	-0.7	0.0
125	-16.2	-0.2	0.0	-1.0	-2.9	0.0
250	-8.7	0.0	0.0	-4.1	-6.0	-0.1
500	-3.3	0.0	0.0	/	/	/

6. Self-generated noise

Microphone Installed: 41.2 dBA

Microphone replaced by electrical input signal device

22.8 dB (A)	36.2dB (C)	42.8 dB (Z)
-------------	------------	-------------

7. F&S Weighting

Rate of the F weighting decrease (dB/s)	35.0
Rate of the S weighting decrease (dB/s)	4.3
Deviation of F&S	0.0

8. Level Linearity (A-weighting at frequency 1 kHz)

(Total measuring range: 33 dBA - 138 dBA, frequency 1 kHz):

Reference level range (frequency 1 kHz):

① 10 dB Interval

Signal	37.0	44.0	54.0	64.0	74.0	84.0	94.0	104.0	114.0	124.0	134.0
Indicating value dB(A)	37.0	44.0	54.0	64.0	74.0	84.1	94.0	103.9	114.0	124.2	134.1
Full scale deviation (dB)	0.0	0.0	0.0	0.0	0.0	0.1	0.0	-0.1	0.0	0.2	0.1

Max error at 10 dB interval 0.2 dB

② 1 dB Interval

Upper Limit	134.0	135.0	136.0	137.0	138.0
Indicating value dB(A)	134.1	135.2	136.2	137.2	138.0
Full scale deviation (dB)	0.1	0.2	0.2	0.2	0.0
Lower Limit	33.0	34.0	35.0	36.0	37.0
Indicating value dB(A)	33.2	34.1	35.1	36.0	37.0
Full scale deviation (dB)	0.2	0.1	0.1	0.0	0.0

Max error at 1 dB- 10 dB interval 0.2 dB

9. Tone burst response (A Weighting)

Single Toneburst duration /ms	Toneburst response /dB			
	LAFmax-LA	LASmax-LA	LAE-LA	LAeqT-LA
500	-0.1	-4.0	-3.1	-7.0
200	-1.0	-7.5	-7.0	-7.0
2	-18.0	-27.1	-27.1	-7.1
0.25	-27.2	/	-36.1	-7.1

10. Overload indication: Pass

Scarlet Tech Co., Ltd.

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Scarlet Tech Co., Ltd.

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### 11. C-weighting peak sound level

Number of cycles in test signals	Nominal frequency of test signal/Hz	(LCpeak-LC)/dB			tolerance limits : class 2/dB
		Reference level range		Reference difference	
		4dB low of upper limit			
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Positive half cycle	500	2.3		2.4	±2.0
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Index	(dB)		
	SLM Reading	Expected Reading	Deviation
LAeq	110.4	110.4	0.0
L5	118.0	118.0	0.0
L10	116.0	116.0	0.0
L50	99.9	100.0	-0.1
L90	84.0	84.0	0.0
L95	82.0	82.0	0.0

13. SD card function: Pass

#### References:

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- IEC 61260-1:2014 Electroacoustics-Octave-band and fractional-octave-band filters - Part 1: Specifications
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#### Environment conditions:

Air temperatura: 20 °C Relative humidity: 55 % Static pressure: 102.2 kPa